The rejections are respectfully traversed.

Applicants are submitting herewith a certified English language translation of the priority document herein, JP 11-91091 filed March 13, 1999, and which thus affords the subject application an effective priority benefit date of March 13, 1999.

By contrast, the primary reference to Yamada et al. has an effective prior art date of October 20, 1999 as a reference against the subject application -- and which accordingly is avoided as prior art by applicants' reliance on the benefit of the aforesaid Japanese priority application.

Yamada et al. accordingly should be removed as a reference and such action is earnestly solicited. Since Yamada et al. is essential to each of the grounds of rejection, there remain no bases for the rejection of the pending claims and, instead, the pending claims are submitted to be patentable.

The specification amendments include amendments corresponding to the changes in Fig. 3 set forth in a concurrently filed Letter to the Examiner Requesting Approval of Changes in the Drawings, responsive to the drawing objection in the Notice of Draftsperson's Patent Drawing Review accompanying the Office Action.

There being no other objections or rejections, it is submitted that the application is in condition for allowance, which action is earnestly solicited.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: May 20, 2002

By:

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CERTIFICATE UNDER 37 CFR 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231

on ____________, 20____

STAAS & HALSEY

By: ____________

Date: ____________

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

Please substitute the title with the following:

GAS-DISCHARGE DISPLAY APPARATUS HAVING OPTICAL FILTER SELECTIVELY ABSORBING LIGHT OF A WAVELENGTH EQUAL TO THAT OF THE LIGHT EMISSION OF THE DISCHARGE GAS

IN THE SPECIFICATION:

Please AMEND the paragraph beginning at page 2, line 29, as follows:

As shown in Fig. 13, a plurality of light emission spectrums appears in the visible light wavelength range above 580 nanometers. The peak of the light emission of the discharge gas (585 nanometers) is adjacent to the maximum light emission peak (590 nanometers) of the red fluorescent material. Therefore, orange color due to the light emission of the discharge gas is added regardless of the color reproduced by the fluorescent material, so the reddish display occurs over the entire screen. In Fig. 14, the inside of the triangle of the solid line connecting the color coordinates of [each] the respective fluorescent materials, plotted with small rectangles, is the reproducible color range when the color of the gas light emission is not added. In Fig. 14, the inside of the triangle of the broken line is the color reproducible range of the PDP measured in a darkroom. The real color reproducible range is narrowed compared with the original color reproducible range. Especially, reproducibility of blue and green colors is [of] inferior. Concerning the red color, the reproducibility is not so deteriorated since the wavelength of the gas light emission is approximate to that of the light emission of the fluorescent material. However, focusing on the light color of the fluorescent material, the red fluorescent material is different from the ideal red (620 nanometers) defined in the NTSC system. Namely, even if the influence of the gas light emission is little, it is still necessary to improve the color purity of red color. At present, there is no red fluorescent material that emits light of ideal red color and satisfies other use conditions such as efficiency of exciting ultraviolet rays and [a] life. Green and blue fluorescent materials can emit light of substantially ideal color.

Please AMEND the paragraph beginning at page 4, line 29, as follows:

There is a method for adjusting the relative light intensities of red, green and blue colors by selecting the fluorescent materials, a forming shape thereof (i.e., the shape in which the fluorescent material is found) or the forming area thereof (i.e., the area on which the fluorescent material is formed). This method substantially reduces the brightness of the panel since the light intensities of green and red fluorescent materials are weakened compared with that of the blue fluorescent material that is usually lacking in [the] intensity. Furthermore, there is a limited selection of materials as mentioned above. The adjustment by the forming shape has low reproducibility. If the cell size of blue color is increased to enlarge the forming area thereof, the margin of the voltage to be applied is narrowed and the display becomes unstable since the display characteristics depend on the cell size. In addition, manufacture of panels having different light intensities of the fluorescent material in accordance with the use and the region (country) of use may deteriorate the productivity.

Please AMEND the paragraph beginning at page 5, line 30, as follows:

Another problem about the color temperature is that contrast in a well-lighted room is low. The contrast in a well-lighted room (hereinafter, referred to as the bright-room contrast) means a ratio of intensity of light emitted by the fluorescent material and intensity of external light reflected by the PDP. In general, PDPs have .a large reflection ratio of external light and a small value of the bright-room contrast. It is clear that the bright-room contrast will be improved by raising the light intensity of the panel and reducing the reflection ratio of external light, but it is not easy to satisfy the compatibility between them. For example, improvement of the filter for EMI measure is considered. Usually, the front surface of the PDP is provided with a filter having transmittance of 40-70% over the entire region of visible light wavelength for protecting interference of electromagnetic field. Though the light emitted inside the panel passes through the filter only once, the external light passes through the filter twice, once each in both directions. Therefore, the filter improves the bright-room contrast. If the filter having less transmittance is used, the bright-room contrast is further improved. However, since the improvement of the color temperature by the above-mentioned method will reduce the light intensity of the panel, the filter having low transmittance cannot be used for improving the bright-room contrast.

Please AMEND the paragraph beginning at page 10, line 15, as follows:

Fig. 3A is a schematic view of a planar display apparatus.

Fig. 3B is an exploded view of a representative portion of the PDP of Fig. 3A illustrating an internal construction of same according to the present invention.

Please AMEND the paragraph beginning at page 11, line 19, as follows:

The plasma display apparatus 100 includes a PDP 1 that is a color display device, a driving unit 80 for lighting cells of the PDP 1 in accordance with display contents, an optical filter 60 having a spectrum transparent characteristic unique to the present invention, a front plate 92 for protecting the PDP 1, and an armor cover 90. The front plate 92 is made up by providing an electromagnetic field shield film and an infrared cutting filter onto a substrate that is optically transparent, and applying a surface treatment for non-glare finish. Glass, acrylic resin, polycarbonate, or other materials can be used for making the substrate.

Please AMEND the paragraph beginning at page 12, line 1, as follows:

The optical filter 60 has a dimension covering the entire screen that is a set of cells in the PDP 1, and is in intimate contact with the front surface of the PDP 1. The optical filter 60 can be formed by a process such as sticking (i.e., adhering) a laminated filter film, sticking a film in which a pigment or a colorant is dispersed, or laminating a multicoated interference film utilizing thin film technology [. Such sticking or laminating can be processed to] on the front surface of the PDP 1 directly, or [to] on the front plate 92 so as to overlay [on] the surface of the PDP 1. Characteristics of the optical filter 60 and the front plate 92 are uniform over the entire screen.

Please AMEND the paragraph beginning at page 12, line 13, as follows:

Figs. 2A and 2B show structures of other plasma display apparatuses[, that is a variation of arrangement] having various different arrangements of the optical filter.

Please AMEND the paragraph beginning at page 13, line 13, as follows:

Fig. 3A is a schematic view of a planar display apparatus.

Fig. 3B is an exploded view of a representative portion of the PDP of Fig. 3A, illustrating

an internal construction of same according to the present invention.

Please AMEND the paragraph beginning at page 13, line 29, as follows:

In the PDP 1, a pair of main electrodes X and Y is arranged in each row on the inner surface of a glass substrate 11 that is a substrate of a front substrate structure 10. The row is a line of cells in the horizontal direction of the screen. Each of the main electrodes X and Y includes a transparent conductive film 41 and a metal film (a bus conductor) 42, and is covered with an insulating layer 17 having a thickness of approximately 30 microns made of low-melting glass. The surface of the insulating layer 17 is coated with a protection film 18 made of magnesia (Mg0) having a thickness of several thousands angstroms. The address electrodes A are arranged on the inner surface of a glass substrate 21 that is a substrate of a rear substrate structure 20, and is covered with an insulating layer 24 having a thickness of approximately 10 microns. On the insulating layer 24, a division wall 29 having a shape like a band of height 150 microns viewed from the top is disposed at each space between the neighboring address electrodes. These division walls 29 divide the discharging space 30 in the row direction into plural subpixels (plural unit lighting regions), and define the gap size of the discharging space 30. In addition, red fluorescent material 28R, green fluorescent material 28G and blue fluorescent material 28B for color display are arranged coating the inner surface of the rear side including the upper portion of the address electrode A and the side surface of the division wall 29, so that the three colors are arranged in a periodic pattern. The fluorescent materials 28R, 28G and 28B are selected so that white color is reproduced when each of them emits light in the maximum intensity, and the forming shapes of them are the same. A preferred example of the fluorescent materials is shown in TABLE 1.

Please AMEND the paragraph beginning at page 17, line 12, as follows:

The inventors have studied about the wavelength range to be eliminated, and obtained the following result. Namely, if the wavelength spectrum of the light emission spectrum in which the product of the light intensity and the relative luminosity factor becomes the maximum, i.e., 585 nanometers and the surrounding wavelength spectrum [is] are eliminated, the purities of blue and green colors can be improved along with suppressing the deterioration of red color intensity, the latter result being achieved, at [the] a minimum. In addition, the spectrum of red light emission approaches the monochrome light emission of 620 nanometers that is the ideal in the NTSC standard.

Please AMEND the paragraph beginning at page 17, line 23, as follows:

Fig. 5 is a chromaticity diagram showing the result of [the] a filter having a peak absorbency wavelength of 590 nanometers in blue color display. Fig. 6 is a chromaticity diagram showing the result of the filter having a peak absorbency wavelength of 590 nanometers in red color display. Here, an imaginary filter having an ideal absorbency characteristics as shown in Fig. 7 is supposed for studying about the relationship between the transmittance T and the chromaticity at the peak absorbency.

Please AMEND the paragraph beginning at page 18, line 8, as follows:

The improvement of the color temperature will be explained next. As explained above, if a filter that absorbs light having a wavelength around 590 nanometers is provided, the light intensity of red color decreases and the coordinate of the white color on the chromaticity diagram moves in the direction in which the x value decreases. In other words, the color temperature increases as the arrow in Fig. 8 shows. It is desirable that the chromaticity coordinate in white color be on the blackbody radiation curve shown by the thick line in the figure. However, if the light intensity of only red color is attenuated, deviation from the blackbody radiation in the Y-axis direction increases along with the increase of the attenuation. When the chromaticity coordinate shifts in the direction that Y value increases from the blackbody radiation curve, white color becomes greeny white. When the chromaticity coordinate shifts in the direction that the Y value decreases, the white color [becomes containing] starts to contain a little purple. Neither change of white color is desirable. In order to solve this problem, the filter preferably has a characteristic having peak absorbency in the green color wavelength range, too. The transmittance of the filter is set so that the light intensity of the green color decreases to the extent corresponding to the decrease of red color, so that the chromaticity coordinate of the white color can be corrected to be a coordinate on the blackbody radiation curve. Such adjustment of color temperature, though it causes decrease of light intensity due to transparency of the filter, has advantages in that the bright-room contrast is improved in contrast to the adjustment of the signal amplitude that is adopted in the conventional technique, and in that the optimal color temperature can be realized easily in accordance with the use only by changing the filter characteristic. The reason why the bright-room contrast is improved is as follows.

Please AMEND the paragraph beginning at page 19, line 24, as follows:

Supposing that R and S are constants, the larger L_o is or the smaller T is, the larger the contrast ratio becomes. The improvement of the color purity and the adjustment of the color temperature according to the present invention do not reduce the light intensity L_o, since the adjustment of fluorescent material, the cell structure, and the signal amplitude. In addition, the improvement of the color purity and the adjustment of the color temperature are achieved by reducing the transmittance T, so that the bright-room contrast is improved.

Please AMEND the paragraph beginning at page 22, line 3, as follows:

In the characteristics of Fig. 11, an absorbency is added whose peak wavelength is close to the wavelength of 525 nanometers, that is, a light emission peak wavelength of the green color fluorescent material 28G so as to solve the problem of the color temperature in the characteristics of Fig. 9. Namely, a first peak absorbency wavelength is a value within the range of 550-620 nanometers (585 nanometers), and a second peak absorbency wavelength is a value within the range of 500-550 nanometers (525 nanometers). The transmittance T_{585} at the wavelength of 585 nanometers is smaller than both the transmittance T_{450} at the wavelength of 450 nanometers and the transmittance T_{620} at the wavelength of 620 nanometers. In addition, the transmittance T_{525} at the wavelength of 525 nanometers is smaller than the transmittance T_{450}. Particularly, the transmittance T_{585} is smaller than 0.7 times the transmittance T_{450} and is smaller than 0.5 times the average transmittance in the blue color wavelength range (distributed light emission of blue color fluorescent material).

Please AMEND the paragraph beginning at page 23, line 16, as follows:

The color temperature can be adjusted to any value within the range of 5,000-13,000 K by controlling the spectrum transparent characteristic of the optical filter 60. More specifically, if the absorption quantity around 590 nanometers in Fig. 11 is increased so that the transmittance becomes less than 10%, a color temperature above 10,000 K can be achieved and the same performance as a CRT for TV set can be realized. If the absorption quantity around 590 nanometers is decreased to that the transmittance becomes approximately 50%, a color temperature about 6,500 K can be achieved and the same performance as that of a CRT for publishing or designing use or a CRT for a TV set used in Europe can be realized. Namely, a

display apparatus having the optimum color reproducibility for use and area (country) can be provided by changing the spectrum transparent characteristic of the optical filter 60 without changing the material and the structure of the PDP 1, so that cost reduction of the apparatus can be realized.

IN THE CLAIMS

1. (ONCE AMENDED) A gas-discharge display apparatus utilizing at least one of neon and helium gases to generate a gas discharge for exciting three kinds of fluorescent materials [having] which emit different light colors [to emit light for displaying] to display a color image on a display screen thereof, [wherein the apparatus includes] comprising:

an optical filter [that is an element overlapping] covering the entire screen[, being] and disposed in front of a gas discharge space, [for] selectively absorbing light having a wavelength equal to that of light emission of the gas, and [the optical filter has] having characteristics in which [the] a transmittance T_{585} at [the] a wavelength of 585 nanometers is smaller than [the] each of a transmittance T_{450} at [the] a wavelength of 450 nanometers and [the] a transmittance T_{620} at [the] a wavelength of 620 nanometers.

2. (ONCE AMENDED) The apparatus according to claim 1, wherein the optical filter further has characteristics in which [the] a wavelength of peak absorbency in [the] a visible light wavelength range has a value within [the] a range of 550 to 620 nanometers.

3. (ONCE AMENDED) A gas-discharge display apparatus utilizing at least one of neon and helium gases to generate a gas discharge for exciting three kinds of fluorescent materials [having] which emit different light colors [to emit light for displaying] to display a color image on a display screen thereof, [wherein the apparatus includes] comprising:

an optical filter [that is an element overlapping] covering the entire display screen[, being] and disposed in front of a gas discharge space, [for] selectively absorbing light having a wavelength equal to that of light emission of the gas, and [the optical filter has] having characteristics in which first and second peak absorbencies exist in [the] a visible light wavelength range, [the] a wavelength of [the] a first peak absorbency has a value within [the] a range of 550 to 620 nanometers, and [the] a wavelength of [the] a second peak absorbency has a value within [the] a range of 500 to 550 nanometers.

4. (ONCE AMENDED) A gas-discharge display apparatus utilizing at least one of neon and helium gases to generate a gas discharge for exciting three kind of fluorescent materials [having] which emit different light colors [to emit light for displaying] to display a color image on a display screen thereof, [wherein the apparatus includes] comprising:

an optical filter [that is an element overlapping] covering the entire display screen[, being] and disposed in front of a gas discharge space, [for] selectively absorbing light having a wavelength equal to that of light emission of the gas, [the optical filter has] and having characteristics in which first and second peak absorbencies exist in the visible light wavelength range, [the] a transmittance T_{585} at [the] a wavelength of 585 nanometers is smaller than [the] each of a transmittance T_{450} at [the] a wavelength of 450 nanometers, a [and the] transmittance T_{620} at [the] a wavelength of 620 nanometers, and [the] a transmittance T_{525} at [the] a wavelength of 525 nanometers is smaller than [the] a transmittance T_{450} at a wavelength of 450 nanometers.

5. (AS ONCE AMENDED) The apparatus according to claim 1, wherein the transmittance T_{585} is smaller than 0.7 times the transmittance T_{450}.

6. (AS UNAMENDED) The apparatus according to claim 4, wherein the transmittance T_{585} is smaller than 0.7 times the transmittance T_{450} and is smaller than the transmittance T_{525} .

7. (ONCE AMENDED) The apparatus according to claim 1, wherein the optical filter [is made as] comprises a component separate from a display device having the gas discharge space therein, and is disposed in front of the display device.

8. (AS UNAMENDED) The apparatus according to claim 7, wherein the optical filter is made of a film having said characteristics.

9. (ONCE AMENDED) The apparatus according to claim 1, wherein the optical filter is in contact with the front surface of a transparent substrate [making up] comprising the display screen.

10. (ONCE AMENDED) The apparatus according to claim 1, wherein the optical filter [is made of] comprises an organic resin in which a substance absorbing light of a specific

wavelength is dispersed.

11. (ONCE AMENDED) The apparatus according to claim 1, [wherein] further comprising a non-glare layer is disposed in front of the optical filter.

12. (ONCE AMENDED) A gas-discharge display apparatus utilizing at least one of neon and helium gases to generate a gas discharge for exciting three kinds of fluorescent materials [having] which emit different light colors [to emit light for displaying] to display a color image on a display screen thereof, [wherein the apparatus includes] comprising:

an optical filter [that is an element overlapping] covering the entire screen[, being] and disposed in front of a gas discharge space, [for] selectively absorbing light having a wavelength equal to that of light emission of the gas, [the optical filter has] and having characteristics in which first and second peak absorbencies exist in [the] a visible light wavelength range, [the] a wavelength of [the] a first peak absorbency has a value within [the] a range of 580 to 600 nanometers, [the] a wavelength of [the] a second peak absorbency has a value within the range of 500 to 550 nanometers, [the] a transmittance of the optical filter at the first peak absorbency is smaller than 0.5 times [the] an average transmittance in [the] a blue wavelength range, and [the] an average transmittance in [the] a green wavelength range is larger than [the] a transmittance at [the] a first peak absorbency and is smaller than [the] an average transmittance in the blue wavelength range.

13. (ONCE AMENDED) The apparatus according to claim 12, wherein the optical filter [is made as] comprises a component separate from a display device having the gas discharge space therein, and is disposed in front of the display device.

14. (AS UNAMENDED) The apparatus according to claim 12, wherein the optical filter is made of a film having said characteristics.

15. (ONCE AMENDED) The apparatus according to claim 12, wherein the optical filter is in contact with the front surface of a transparent substrate [making up] comprising the display screen.

16. (ONCE AMENDED) The apparatus according to claim 12, wherein the optical filter [is made of] comprises an organic resin in which a substance absorbing light of a specific

wavelength is dispersed.

17. (ONCE AMENDED) The apparatus according to claim 12, [wherein] <u>further comprising</u> a non-glare layer is disposed in front of the optical filter.

18. (AS UNAMENDED) The apparatus according to claim 4, wherein the transmittance T_{585} is smaller than 0.7 times the transmittance T_{450}.